# AERIAL SURVEYING EQUIPMENT

## PROGRESS REPORT

27 February 1956

28 February 1956

Perkin-Elmer Corporation
Projector Division
P.O. Box 68, Ridgeway Station
Stamford, Conn.

Attention: [redacted] STAT

Subject: Progress Report #5

Reference: Your Purchase Order No. 56207

Dear Sir:

Enclosed herewith are two (2) copies of Progress Report #5 on Aerial Surveying Equipment of referenced purchase order. The report covers the period through 27 February 1956.

Very truly yours,

HYCON MFG. COMPANY

[redacted] STAT

Vice President

WCM/pe
enclosure

Item 2 - Contract Status

2.0 Supplemental Agreement No. 1 to Contract of June 21, 1955 dated 28 Dec ember 1955 was received.

2.1 The following Contract Change Proposals to Purchase Order No. 56207 are in preparation:

2.1.1 Technical Manuals
There will be changes in the manuals to be delivered as covered in the basic contract as amended due to contract changes and proposals which changed equipment to be delivered.

2.1.2 New Platen for 9x18 Magazine Model HM-731
Estimates have been made and an exhibit will be prepared to be submitted as a contract change proposal for a new curved platen for the new 24" lens design of HR-731.

2.1.3 Battery and Vacuum Cart
Increase quantity of contract item No. 216 from two (2) to five (5) units and from $2,400 to $6,000.

2.1.4 Maintenance Spares for Basic Equipment
A formal proposal is in preparation based on the heavier schedule of operations.

2.1.5 Ground Support Equipment
Heavier schedule of operations is being studied for necessary changes to the ground support equipment.

2.1.6 Facilities Requirements
Heavier schedule of operations requires re-evaluation of facilities requirements of each base.

2.1.7 Battery and Vacuum Cart
400 cycle inverter added to each cart for Configuration C power requirement.

2.2 The following Contract Change Proposals are held awaiting further information:

2.2.1 Configuration C
Contract change proposal held pending receipt of final optical design data and evaluation of required changes.

2.2.2 Shelter for Preflight Checkout and Installation
This item was deferred as a result of the supply conference held 28 November through 1 December 1955. No present need for this item is now recognized unless satelite base operations are initiated.

Item 2 - Contract Status (continued)

2.3 Associated Contract Status

For information separate contract proposals direct to the customer are being made to cover various support activities.

2.3.1 Ground Support Personnel, increase

Contract coverage for three teams of eight men each is being requested in addition to a four man test site crew through November 1956. A total of 31 men will be recruited and trained.

2.3.2 Factory Overhaul and Depot Spares

Contract coverage is being requested for factory overhaul and the production of depot spares to be held at the factory for overhaul needs.

2.4 Contract Proposals to be superceded or obsoleted.

2.4.1 In-Plant Engineering Support

This proposal will be superceded by the factory overhaul proposal.

Item 3 - Customer Furnished Equipment Status

3.2 (continued)

| | |
|---|---|
| January 24 | (2) rolls of O-2-4000, 73-B |
| January 26 | (80) Mounting Brackets and 270 Screws for Spherical Mirrors<br>(6) rolls of P-2-390, HC-730<br>(6) rolls of O-3-100, HR-731<br>(11) rolls of O-1-1800, HR-731 |
| January 30 | (1) Metalized Leader<br>(1) "B" Elliptical Mirror #5 |
| January 31 | (1) Miniclutch Assembly<br>(1) Bevel Gear |

3.3 The following items were received in the month of February:

| | |
|---|---|
| February 3 | (1) Collimator 100" f/25, Serial #2 |
| February 6 | (1) Searchlight<br>(2) rolls of O-2-4000, 73-B<br>(6) rolls of O-3-100, HR-731<br>(6) rolls of P-2-390, HC-730 |
| February 9 | (1) Searchlight jig and B/P<br>(6) rolls of P-2-390, HC-730<br>(7) rolls of O-3-100, HR-731 |
| February 14 | (18) rolls of P-3-390, HC-730<br>(8) rolls of O-1-1800, HR-731 |
| February 15 | (19) rolls of O-1-1800, HR-731 |
| February 17 | (1) Rotating Mirror Assembly |
| February 20 | (19) rolls of O-1-1800, HR-731<br>(12) rolls of S-2-1000, 70mm |
| February 23 | (3) rolls of P-1-1000, 70mm<br>(4) rolls of S-2-1000, 70mm |
| February 24 | (7) rolls of O-1-1800, HR-731<br>(48) rolls of P-3-390, HC-730 |
| February 26 | (12) rolls of O-1-1800, HR-731 |

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5.2 Configuration B

The first B camera was completed in January with the factory test program completed in February. Numerous modifications, particularly in the film transport, shutter and rocking drive mechanisms, were incorporated during February. The total camera weight is 266 pounds, less film, against an estimated 216 pounds.

A test flight was run 25 February 1956 in A/C #4. A total of 355 exposures were made. No camera or A/C malfunction was encountered. Due to conference schedule requirement, a decision was made to process results at the Ranch. Necessary haste in use of the processing equipment caused difficulties which degraded the results thru static, water marks, uneven development, streaking, etc. Tenative evaluation indicated results can be classed from "good" to "excellent". Samples of photography have been prepared.

Production

A number of engineering changes have been generated during the factory test program. These changes, plus flight test changes, will be incorporated into production units immediately. Modification and rework in the film drive, shutter and rocking drive mechanisms is in progress. The majority of all parts for all cameras are on hand, although certain of the parts will require extensive rework. Items, such as shutter and film drive parts, are critical and will require extended expediting effort. Delivery of unit number two is anticipated in April with subsequent units due 30 day increments.

Procurement

No known procurement bottlenecks are now facing the program.

## 5.3 Configuration C

New weight estimates of Configuration C indicated that a substantial increase in weight has resulted, principally, due to the requirement for a new stabilizer, a larger optical aperture of 13 inches and a longer focal length. Consequently, it was decided to reduce the spool diameter to 15 inches from 20 inches providing only normal load capacity of 4000 ft. of film. This redesign results in a substantial weight saving, however, it is predicted that the configuration will still be overweight by approximately 30 lbs. Careful design may reduce this overload somewhat but probably not greatly.

A camera breadboard including superstructure, stabilizer, rocking mirror and actuators, electrical controls and programmer is being designed for installation in an aircraft. A 35mm camera with long focal length lens will also be installed. Thus, performance of the stabilizer, rocking mirror, hand control and computer can be evaluated under actual flight conditions.

### 5.3.1 Design

Preliminary design of the optical structure was started. This is being closely coordinated with the optical manufactureer.

The main support bearing and a breadboard stereo actuator were designed. The main bearing was released for bid and coordination.

The camera superstructure holding the cassettes and film drive is being redesigned to accommodate the smaller film cassettes.

A three-axis stabiliser breadboard is being designed suitable for evaluation under actual flight conditions.

The film drive is being modified to fit into the available space in the new design.

The automatic exposure control is being redesigned and packaged.

### 5.3.2 Production

The breadboard disc shutter is being manufactured. Fabrication of the film spools and cassettes was stopped. The stereo actuator was released for production. The flight test analyzer is nearly complete.

### 5.3.3 Procurement

Two Hig -5 rate gyros for the stabilizer breadboard were ordered. A third Hig -5 is available from the one-axis breadboard.

5.4 [redacted] Operations STAT

A total of ten Photographic Test Flight Missions were accomplished during December. The second A-2 Configuration was received at the site and initially flight tested on 15 December. At this time, Configuration A-2, Serial #1 was returned to the factory for modification and life test evaluation. The modified A-1 Configuration, Serial #2 was received at the site on 7 December. Enclosure I of this report outlines a summation of photo test flight results with the three configurations present at the site.

The majority of tests conducted were flown over a resolution pattern at the site. Desired information was the change in focus due to variations in air density and temperature at maximum flight altitudes. A special tilted platen magazine was utilized on the vertical camera on most flights to obtain this data. The 24" standard lens at ground focus appears to be properly focused at altitude though additional investigation is being made of the effect of temperature variations and gradients.

During the period from 1 December 1955 to 21 February 1956 a quantity of 66 missions were scheduled. Of this total 41 were flown and malfunctions encountered on 22 missions. (see detail tables) Malfunctions have been evaluated and it has been determined that none of the difficulties were of basic significance. In fact, none of the expected basic difficulties concerned with altitude, temperature, pressure and window fogging have proven to be significant in the A Configuration. We have been more fortunate in this area than anticipated. Malfunctionsto date have been concerned primarily with adjustment techniques, minor mechanical defects, and establishment of operational procedures. It should be noted that the increased level of operations has made the spare problem critical and that operations are now paced by the availability of maintenance and repair areas.

Due to the increased operational requirement of simultaneously supporting the detachment training program and the photo test program, additional personnel have been added to the resident field team at the site bringing the total to six persons.

During the November shut down period, film processing facilities were expanded with the addition of a new darkroom to house the A-9 Continuous film processor and the A-14 film dryer. This equipment was installed and readied for operation on 31 December. Additional utilities are presently being made available for the 70mm continuous processor and the 70mm duplicator expected in February. The air conditioning unit for humidity and temperature control of the service area was installed. Space considerations for 70mm equipment are larger than anticipated.

A/C with instrumentation (A.O.) were unavailable for the photo test program during December. This was due to a transition from test to training application of the available A/C. This greatly limited the photo test program in obtaining flight data and recordings of inflight equipment performance. During December, one each A-1 and A-2 A/C equipment bay hatches were available. As these were not readily interchangeable between A/C, this restricted the operational flexibility of being able to schedule, upon quick notice, certain configurations for the three A/C available.

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5.4 [redacted] Operations (Cont'd) STAT

now renders them operationally reliable.

Additional personnel were added to the resident field team bringing the total to nine. This number will be further expanded to 13 in the very near future in order that the Detachment "A" and the Photo Test Program can be simultaneously supported. To facilitate the increased operations and to accommodate the additional personnel and ground support equipment, action has been taken to expand the shop, storage and work areas. A letter was submitted to the Base C. O. outlining these additional space requirements and action is now pending.

A continuing training program has been conducted at the [redacted] during weekends and STAT off hour periods. Instruction included technical review of the "A", "B", and "C" photographic systems and equipment, operational and handling procedures, testing and trouble shooting, film reading, and evaluation.

Allied system equipment, including the drift sight, hand control and Tracker camera, was installed, modified and repaired by a team from the manufacturing company. Instruction was presented on these equipments to pilots and test site photo personnel.

Film processing facilities were improved with the use of the A-9 continuous developer and the A-14 film dryer. Handling techniques were improved with the thin base film, and action has been initiated to aid development through use of nitrogen injection in the solutions. The use of powdered chemicals has proven satisfactory in place of the liquid concentrates previously used.

Test and shop facilities have been expanded with the addition of mechanical and electrical fixtures and special tools. Preparations are being made to have available the ground support equipment for the Detachment A operation. The 30-day fly away kit for Detachment "A" was received at the site and contains items required for support of configurations A-1 and A-2. Consumption data will be developed through usage of this kit in conjunction with the training program.

5.4 [redacted] Operations (Cont'd) STAT

During the period 1 February through 21 February 1956 a total of 20 photo Test Flights were accomplished in which 10 malfunctions occured. These may be divided into three types for study. First, those due to unimportant performance such as PTF 95 where the light did not go out indicating the end of the film and there was one such. Second, malfunctions have resulted from improper loading or pre-flight checking such as in flights 93, 85, 76 and 70. It is gratifying to note that the same error was not made twice and as training and experience improve the number of such is expected to decrease. The third type is true equipment malfunction. PTFs 88, 84, 77 and 75 are of this sort. Here it should be noted that all these flights were in Article 346 and are related to a malfunction of the IMC unit. This trouble is being attacked by a minor re-design of the IMC unit to make it insensitive to alignment and an examination of Article 346 is requested. The tenth malfunction, PTF 87, was the result of a component, a diode noise suppresser, shorting out. This in itself did not stop the cameras but it resulted in all the lights going out and then the Pilot turned off the configuration. This fault is important for its result was the same as a true camera malfunction -- no pictures. It will be fixed by increased inspection and replacement by a unit of higher rating.

ENCLOSURE 1



## SUMMARY OF ACTIVITIES
9 December through 30 December 1955

| Date | PTF | Conf. & Unit | Article | Load | No. of Exposures | Mal-function | Remarks |
|---|---|---|---|---|---|---|---|
| 12-9 | 29 | A-2-1 | 344 | 180 | 54 | yes | Improper metering cameras 1 & 3. Hydraulic fluid on windows. |
| 12-9 | 30 | A-1-2 | 343 | 600-1800 | 49-0 | yes | Torn film-camera 4. Malfunction of rocking mount. |
| 12-10 | 31 | A-2-1 | 343 | 90 | 54 | no | Satisfactory equip. operation |
| 12-12 | 32 | A-2-1 | 343 | 180 | 112 | yes | Metering oblique cameras condensation on windows. |
| 12-13 | 33 | A-2-1 | 343 | 390 | 446 | no | Oil, condensation on windows. |
| 12-15 | 34 | A-2-2 | 344 | 1800 | 133-40-133 | yes | Magazine overload-Camera 2 |
| 12-21 | 35 | A-2-2 | 343 | 1735-140-1470 | 187-83-187 | no | Condensation on windows. |
| 12-22 | 36 | A-1-2 | 344 | 500-1570 | | | mission cancelled - weather. |
| 12-22 | 37 | A-2-2 | 343 | 1800 | | | Mission cancelled-Article trouble. |
| 12-28 | 38 | A-2-2 | 343 | 1400 | | | Mission cancelled-Article trouble and hatch fitting problem |
| 12-29 | 39 | A-2-2 | 343 | 1800 | 50-430-428 | yes | Magazine overload, torn film, film jam. |
| 12-30 | 40 | A-1-2 | 342 | 610-1800 | 1167 | yes | Film cycling failure-camera 4 |

# SUMMARY OF ACTIVITIES
1 February through 21 February 1956

| Date | PTF | Conf. & Unit | Article | Load | No. of Exposures | Mal-function | Remarks |
|---|---|---|---|---|---|---|---|
| 2-1 | 68 | A-2-1 | 345 | 1800 | | | Cancelled, weather |
| 2-1 | 69 | A-1-2 | 344 | 390-400 | | | Cancelled, weather |
| 2-2 | 70 | A-2-1 | 345 | 1800 | 65 | yes | No vacuum because caps on lines in wheel well |
| 2-2 | 71 | A-1-2 | 344 | 390-400 | 479-317 | no | Satisfactory equip. operation |
| 2-3 | 72 | | | | | | Cancelled |
| 2-3 | 73 | A-1-3 | 344 | 390-1800 | 60-189 | no | Satisfactory equip. operation |
| 2-7 | 74 | A-2-4 | 345 | 400 | 245 | no | Satisfactory equip. operation |
| 2-9 | 75 | A-2-3 | 346 | 1300 | 312 | yes | IMC bind-up |
| 2-9 | 76 | A-2-3 | 345 | 390-1800 | 213, 70, 213-331 | yes | IMC timing adjustment |
| 2-9 | 77 | A-2-4 | 346 | 1800 | 79 | yes | IMC bind-up |
| 2-9 | 78 | A-1-4 | 344 | 390-1800 | 300-850 | no | Vacuum fluctuated |
| 2-10 | 79 | A-1-5 | 345 | 390-1800 | 240-468 | no | Oil leak in art. oil on window question of shutter function. |
| 2-10 | 80 | A-2-4 | 346 | 1800 | 34 | yes | All equip. operated properly however all lights out after flameout. |
| 2-11 | 81 | A-1-4 | 344 | | | | ready but not flown in article. |
| 2-13 | 82 | A-1-4 | 346 | 390-1800 | 390-1157 | no | IMC breaker open post check, all film ran thru. |
| 2-14 | 83 | | | | | | Not loaded-flight cancelled. |
| 2-14 | 84 | A-2-4 | 346 | 800 | 100 | yes | IMC Jam |
| 2-14 | 85 | A-1-5 | 343 | 250-1700 | 253-304 | yes | Film jam |
| 2-14 | 86 | A-1-4 | 344 | 390-700 | 38-97 | no | Test flight, camera on-off. |
| 2-15 | 87 | A-1-4 | 343 | 380-1800 | 352-1157 | yes | Diode shorted, light went out, config. OK oil, condensation window. |
| 2-15 | 88 | A-2-5 | 346 | 1800 | 14 | yes | All lights out after 15 minutes of operation. |
| 2-15 | 89 | A-2-3 | 344 | 100 | 38 | no | Lens cap on 1 camera. |
| 2-16 | 90 | A-1 | 344 | | | | Ready but not loaded. Engine change & short flights. |
| 2-17 | 91 | A-1 | 344 | 360-815 | | | Cancelled, Article problems. |
| 2-17 | 92 | A-2-4 | 345 | 1800 | 240 | no | Pilot turned off cameras, one light out, cause not known. |
| 2-17 | 93 | A-1-5 | 347 | 390-1600 | 180-294 | yes | Film breakage(RO)overload drive disengage rocker camer |
| 2-18 | 94 | A-1-3 | 344 | | | | No photos due late take off. |
| 2-21 | 95 | A-2-3 | 345 | 1445 | 898 | yes | C light did not go out at end of film. |

## 5.5. Ground Support Equipment

Equipment required for the increased operational schedule at the level of 32 missions per month per base has been studied and recommendations are prepared. A contract change proposal is now in preparation.

### 5.5.1 Design

Design on all A and B Configuration ground handling equipment is substantially complete. Configuration "C" ground handling equipment will remain in design during March and April. Reports on the use of the ground handling equipment by Service Personnel is being evaluated and modification incorporated.

### 5.5.2 Production

Production will be 80% complete on all items by 31 March. Many items have been completed and delivered including Tote Boxes, Test Benches, Battery and Vacuum Carts, Transit Dolly, Slings, and General Test and Repair Equipment.

### 5.5.3 Procurement

The general picture on procurement is good although some difficulty is being experienced on some purchased parts such as the Stereo-Viewer, and various smaller items. Engineering follow-through has been initiated in this area for substitution, wherever possible, and prompting of the supplier to expedite the program.

## 5.6 Technical Publications

The following Technical Manuals have been completed:

| | |
|---|---|
| Publication No. 5106 | 9x9 Camera Model HC-730 |
| Publication No. 5108 | Shutter Model HS-730 |
| Publication No. 5114 | 9x9 Magazine Model HM-730 |
| Publication No. 5115 | 9x18 Magazine Model HM-731 |
| Publication No. 5116 | Model 73-B, Cassette |
| Publication No. 5117 | 9x18 Camera Model HR-731 |
| Publication No. 5118 | A-2 Mount Model 7312 |
| Publication No. 5119 | Shutter Model HS-731 |
| Publication No. 5124 | Vibration Detector Model 73-B |
| Publication No. 5125 | 7310 Rocking Mount Assembly |
| Publication No. 5126 | Programmer, Model 73-B |

The following Technical Manuals are currently in preparation:

A-1 Configuration System
A-2 Configuration System
Camera Model 73-B
Film Drive 73-B
Shutter Model 73-B
Optics and Optical Structure, B Configuration
Oblique Drive, B Configuration
B Configuration System

## 6.3 Operations Proposal

The proposed new operational planning calls for a total of 576 missions of all kinds for the year 1956. Starting in April of 1956 through December of 1956 this is broken down per month as follows:

| | |
|---|---|
| April | -16 Missions |
| May | -48 Missions |
| June | -48 Missions |
| July | -48 Missions |
| August | -64 Missions |
| September | -80 Missions |
| October | -80 Missions |
| November | -96 Missions |
| December | -96 Missions |

The proposed new planning for spares and support equipment shall be based on a total of 800 missions for 1957 per [redacted]. at the Suppliers meeting 12 December 1955, Los Angeles. STAT

The new requirements for spares and support equipment shall be based on maximum operational rate as noted in Section 6.2.1 of this report.